Research Article Journal of Orthoptera Research 2025, 34(2): 159–168

Rediscovery of the Monte Gordo Grasshopper *Eyprepocprifas insularis*: An ancient brachypterous species endemic to São Nicolau, Cape Verde (Orthoptera, Eyprepocnemidinae)

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Academic editor: Axel Hochkirch | Received 10 December 2024 | Accepted 30 December 2024 | Published 24 April 2025

https://zoobank.org/BCEBB598-FA80-4105-865A-931DE2E670C3

Citation: Felix R, Jacobs A, Lecoq M (2025) Rediscovery of the Monte Gordo Grasshopper *Eyprepocprifas insularis*: An ancient brachypterous species endemic to São Nicolau, Cape Verde (Orthoptera, Eyprepocnemidinae). Journal of Orthoptera Research 34(2): 159–168. https://doi.org/10.3897/jor.34.144016

Abstract

The Monte Gordo Grasshopper *Eyprepocprifas insularis*, considered extinct, was rediscovered on the island of São Nicolau, Cape Verde, in 2023. This unique brachypterous grasshopper is a "living fossil" endemic to the archipelago. This paper provides updated taxonomic information, describes the female for the first time, examines habitat characteristics and the impact of human activity, and proposes an IUCN Red List status. The study emphasizes the need for further research on this resilient yet threatened species.

Keywords

Africa, extinct, grasshopper, highlands, Red List, taxonomy

Introduction

Eyprepocprifas insularis Donskoff, 1982 was first discovered by ML and colleagues of the Programme de Recherche Interdisciplinaire Francais sur les Acridiens du Sahel (PRIFAS) in October 1980 on the island of São Nicolau, Cape Verde. It is the only brachypterous grasshopper endemic to this archipelago. Only one male specimen was found, and despite long periods spent on the islands between 1979 and 1982 by ML, no other specimen was encountered. Therefore, Lecoq (1996) and Baéz and Oromí (2005) declared the species extinct.

During a trip to São Nicolau from 23–28 Jan. 2023, RF and AJ rediscovered the species and found it present at several sites in Monte Gordo Natural Park (Fig. 1). This paper presents all current information on *Eyprepocprifas insularis*, including distribution data, habitat characteristics, the first description of the female, and a proposal for a threat category on the IUCN Red List.

Study area

Topography.—The Cape Verde Archipelago is situated in the Atlantic Ocean, approximately 600 km west of mainland Africa. It consists of ten islands and several smaller islets formed through volcanic activity associated with a stationary mantle plume beneath the Cape Verde Rise, an elevated region of the ocean floor of volcanic origin (Carracedo and Troll 2021).

Cape Verde belongs to the Macaronesian ecoregion, together with Madeira, the Azores, the Canary Islands, and the Savage Islands. The most eastern islands (Sal, Boa Vista, and Maio) are geologically older than the western islands and are more eroded, flat, and topographically monotonous. The western islands (Santo

Fig. 1. *Eyprepocprifas insularis* Donskoff, 1982, male. This endemic to Monte Gordo Natural Park, São Nicolau, Cape Verde, was rediscovered in 2023 after being declared extinct. Photo credit: Rob Felix.

Antão, São Vicente, São Nicolau, Santiago, Fogo, and Brava) have steep, high mountains and a rough topography with deep river valleys or ribeiras (Brochmann et al. 1997).

São Nicolau is located between the islands of Razo and Sal in the northern part of the archipelago (Fig. 9) and measures approximately 343 km². The highest point on the island is the inactive volcano Monte Gordo (1,312 m.a.s.l.), part of the Monte Gordo Natural Park (952 ha).

Climate.—The climate on São Nicolao is mainly influenced by the cold Canary current and the northeastern trade wind, less so by a southwestern monsoon. The temperature is balanced by the surrounding ocean and ranges from an average of 22°C during the day in February to 27°C in September. In high mountains, the climate is less influenced by the ocean, and frost may occur in winter. The monsoon blows from August until October and is the main cause of the rainy season, which is irregular and limited. Annual precipitation is marked by low and irregular levels of rainfall ranging from 80–300 mm (lowlands) to more than 1,600 mm (highlands). Rain may be absent for several years, causing catastrophic droughts. The northeastern trade wind carries medium humidity, particularly in autumn and winter, mainly affecting mountains above 600 m.a.s.l. This results in fog, which is of utmost importance for additional water supply to the natural vegetation (Brochmann et al. 1997, Duarte et al. 2008).

Habitats.—Large areas in Cape Verde are covered by open grassland and semi-desert vegetation, and considerable parts of the eastern islands are desertified. Monte Gordo Natural Park on São Nicolau comprises an important humid mountain ecosystem. Significant dense scrublands are characterized by the endemic *Euphorbia tuckeyana* and other endemic taxa such as *Dracaena draco caboverdeana*, *Asteriscus smithii*, and *Sideroxylon marginatum*. The presence of these species is thought to reflect the composition of local vegetation before human colonization.

Faunistic taxa endemic to São Nicolao and occurring in Monte Gordo are the following reptiles: *Hemidactylus nicolauensis* Vasconcelos, Köhler, Geniez, & Crochet, 2020, *Tarentola nicolauensis* Schleich, 1984, and *Chioninia nicolauensis* (Schleich, 1987) (Vasconcelos et al. 2012, 2013, 2020). Two weevil beetles of the genus *Dinas* are endemic to Monte Gordo and its surroundings (Skuhrovec and Batelka 2014).

The human impact on natural habitats has been considerable for over 500 years, and most vegetation is severely disturbed. The combination of harsh climate and human disturbance limits the regeneration potential of the vegetation, and only remnants of supposedly natural vegetation are left. Monte Gordo Natural Park holds an extensive afforested area planted in the 20th century, mainly comprising the introduced *Pinus*, *Eucalyptus*, and *Cupressus* (Castilla-Beltrán et al. 2020).

Methods

Identification and taxonomy.—The specimens were identified using the original species description published by Donskoff (1982). Taxonomy follows the Orthoptera Species File (Cigliano et al. 2024).

Institutional abbreviations.—
MNHN Muséum national d'Histoire Naturelle, Paris, France
RFPC Rob Felix Private Collection, Nijmegen, the Netherlands.

Terminology.—Terminology of the morphological characters follows Dirsh (1965) and Uvarov (1966). Mounted specimens of *Eyprepocprifas insularis* were measured with a digital caliper (precision 0.01 mm).

Red List assessment.—The area of occupancy (AOO) of *Eyprepocprifas insularis* was calculated by summing the total area of occupied 2×2 km grid squares. The lower extent of occurrence (EOO) was determined using the minimum convex hull around the confirmed occurrences, while the upper EOO was calculated using the minimum convex hull encompassing the entire estimated geographical range, which may overestimate its actual distribution.

The estimated geographical range of *E. insularis* was derived from our field records, habitat information gathered during our survey, a digital elevation model (Jarvis et al. 2008), satellite imagery, and a vegetation map of Monte Gorde Natural Park, as depicted in Castilla-Beltrán et al. (2020). Satellite imagery was used to analyze vegetation at sites with confirmed records of *E. insularis* and to extrapolate its potential distribution based on similar vegetation in neighboring areas. This analysis was constrained to areas above 550 m.a.s.l. using the digital elevation model.

Due to data limitations, applying all five IUCN criteria categories was impossible. Specifically, there is no information on population status, trends, or sufficient data for quantitative analyses. Therefore, the assessment is limited to criteria B and D2, which rely on the geographic distribution parameters AOO and EOO. Based on these values and information on threats and habitat characteristics entered into the Species Information Service (SIS), IUCN's central database, the appropriate threat category was automatically determined.

Species account

Acrididae
Eyprepocnemidinae
Eyprepocnemidini

***Eyprepocprifas insularis* Donskoff, 1982**
Figs 1–11
Eng. Monte Gordo Grasshopper

Donskoff (1982): 345–349, figs 1–11; Duranton et al. (1983): 201, 203–206, 212–213; Duranton et al. (1984): 41, 42; Launois et al. (1988): 157; Mestre (1988): 325; Lecoq (1996): 88; Mestre and Chiffaud (1997): 117; Baéz and Oromí (2005): 69; Buzzetti et al. (2005): 315; Mestre and Chiffaud (2006): 13, 19, 141; Mestre and Chiffaud (2023): 6, 14, 284.

Material examined.—**Type material. *Holotype***. CAPE VERDE • 1♂; São Nicolau; [670 m.a.s.l.]; [16.6182°N, 24.3324°W]; Oct. 1980; PRIFAS exp. leg.; MNHN-EO-CAELIF10890.

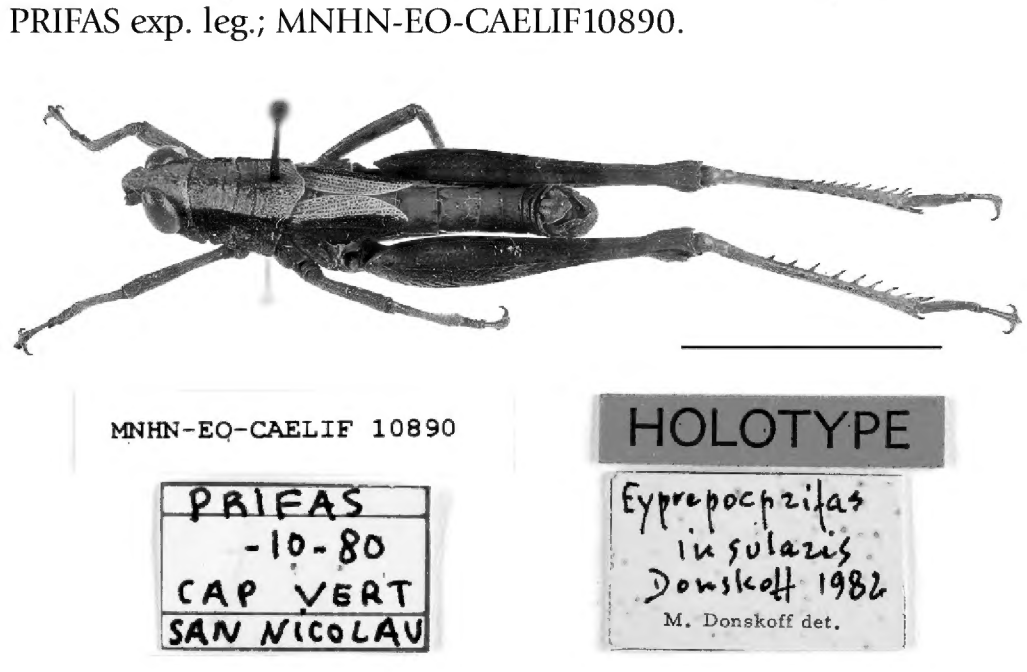

Fig. 2. *Eyprepocprifas insularis* Donskoff, 1982, male, holotype. This specimen, collected by the PRIFAS team at São Nicolau, Cape Verde, in Oct. 1980, was the only known for many decades. Scale bar: 1 cm. Photo credit: Christophe Herve, MNHN, Paris.

Additional material. CAPE VERDE • 1♂; São Nicolau, Cachaço, Monte Cintinha; 670 m.a.s.l.; 16.6246°N, 24.3290°W; 23 Jan. 2023; R. Felix leg.; RFPC • 1♂, 1♀ nymph; São Nicolau, Cachaço, Monte Cintinha; 700 m.a.s.l.; 16.6243°N, 24.3297°W; 23 Jan. 2023; R. Felix leg.; RFPC • 1♂; same data as for previous; RFPC RMNH.INS1622466 • 1♂, 1♀; São Nicolau, Cachaço, Monte Cintinha; 670 m.a.s.l.; 16.6246°N, 24.3290°W; 24 Jan. 2023; R. Felix leg.; RFPC • 1♀; São Nicolau, Cachaço, Monte Cintinha; 710 m.a.s.l.; 16.6236°N, 24.3307°W; 24 Jan. 2023; R. Felix leg.; RFPC RMNH.INS1622467 • 1♂; São Nicolau, Road Tarrafal – Cachaço, Near pass; 800 m.a.s.l.; 16.6182°N, 24.3324°W; 26 Jan. 2023; R. Felix leg.; RFPC.

Diagnostical notes.—Eyprepocprifas insularis is relatively robust and rough and has a pronotum with a distinctly raised median carina; otherwise, it is a typical member of the Eyprepocnemidinae Brunner von Wattenwyl, 1893. Members of this subfamily are characterized by a subconical head with a triangular profile, the absence of the external (pre-)apical spine of the hind tibiae, and the specific morphology of the male internal genitalia. Most eyprepocnemidine genera have bilaterally compressed male cerci with a downwardly curved apex (Dirsh 1965).

To some extent, female *Eyprepocprifas* resemble the nymphs of *Heteracris littoralis* (Rambur, 1838), a species common in Cape Verde at lower altitudes. Female *Eyprepocprifas* have longer antennae, a longer ovipositor, a less globose head, and a median carina of the pronotum that is much more raised. The characters mentioned earlier in this paper easily distinguish it from any other Cape Verdean acridid congener.

Remark.—Donskoff (1982) described the genus and species based on a single male specimen collected near Cachaçao, São Nicolau, Cape Verde (Figs 2, 9). Here, we provide a translation from French of the extensive genus and species description by Donskoff (1982). Observations on our specimens are added. In the case of contradictions with Donskoff (1982), only our observations are shown since they are based on a much larger number of examined and observed specimens (19). The female is described here for the first time. Morphometrics are given in Table 1.

Redescription.—Integument granular, except for smooth ventral surface. Head subconical and triangular in profile, inclined at a 60° angle to the horizontal. Face narrow (2 mm) and elongated (3.5 mm). Fastigium triangular, slightly broader than long, rounded at front, and flat. Frontal ridge highly prominent, measuring 1 mm at fastigium, its base narrow (0.8 mm), and tapering upward, with minimal constriction at the median ocellus. Temporal foveae absent. Lateral ocelli small, positioned beneath the fastigium margin, invisible from above. Interocular space equals width of antennal scape (0.7 mm). Antennae filiform, composed of 22 segments, reaching halfway the tegmina. Eyes oval (2.4 mm/1.3 mm), positioned 1 mm above the genal suture.

Pronotum tectiform, with a raised and horizontal median carina. Lateral carinae well-marked, diverging posteriorly. Three deep transverse sulci cut the median keel. Prozona (2.6 mm) longer

Table 1. Morphometrics of *Eyprepocprifas insularis* Donskoff 1982, males and females. Average values with the ranges in parentheses. Measurements of the holotype are taken from the original species description.

Parameters	Male (N = 6, including holotype)	Female (N = 2)
Body Length (frons–subgenital plate)	19.0 (18.2–19.5)	31.1 (28.8–33.4)
Length Hind Femur	13.3 (12.8–13.9)	20.8 (20.7–20.8)
Length Pronotum	4.6 (4.2–5.0)	8.7 (8.5–8.8)
Length Prozona	2.7 (2.5–2.8)	4.6 (4.5–4.7)
Length Metazona	2.0 (1.7–2.2)	4.1 (4.0–4.1)
Eye Height	2.5 (2.4–2.7)	3.2 (3.0–3.3)
Eye Width	1.4 (1.3–1.4)	1.7 (1.6–1.8)
Interocular Space	0.7 (0.7–0.8)	1.3 (1.2–1.3)
Length Tegmen	5.1 (4.6–5.9)	9.5 (9.1–9.8)

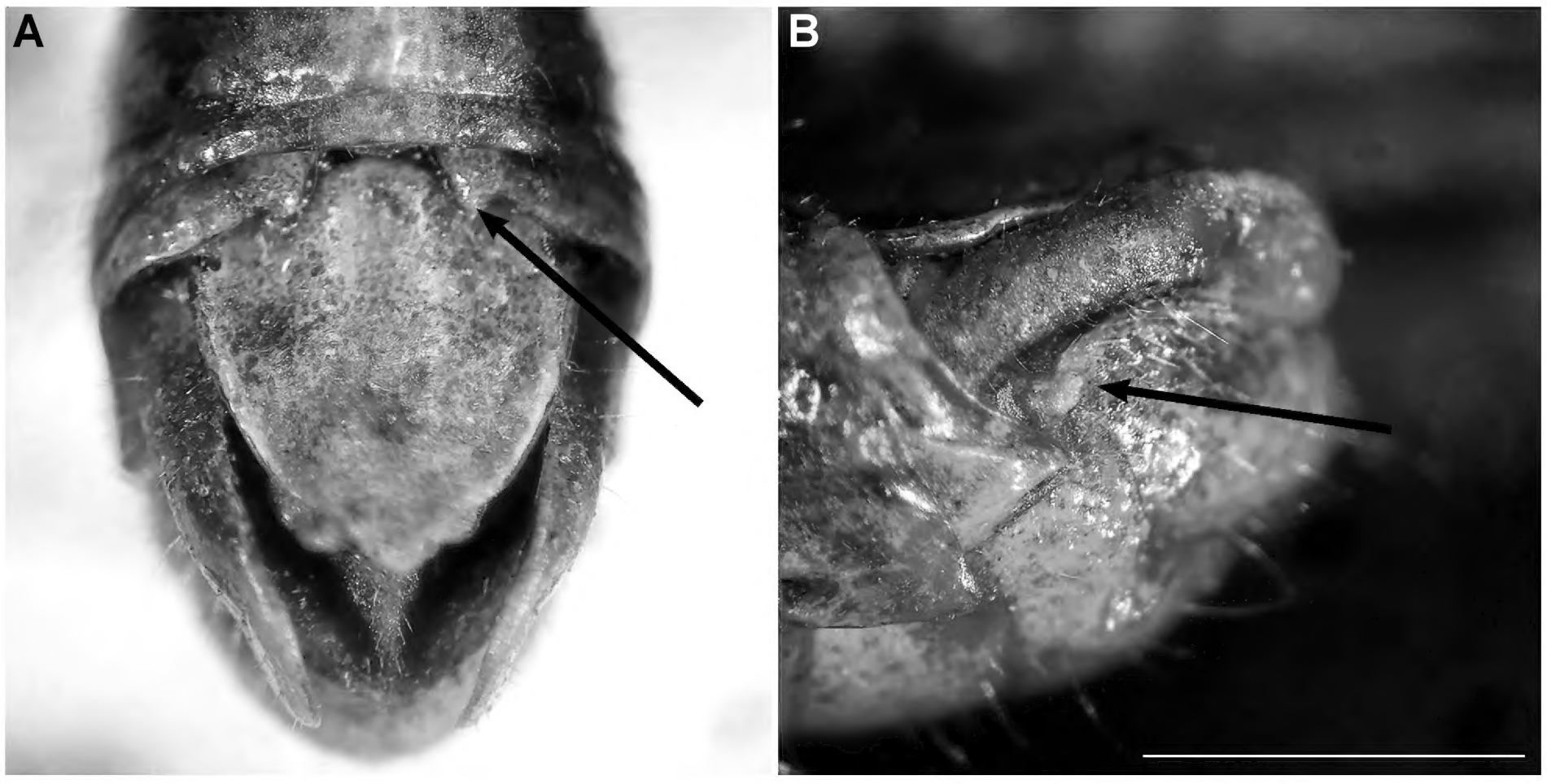

Fig. 3. *Eyprepocprifas insularis* Donskoff, 1982, male terminalia. **A.** Tergite X and epiproct; Furcula is indicated by an arrow; **B.** Paraproct with projection, indicated by an arrow. Scale bar: 1.5 mm. Photo credit: Rob Felix.

than metazona (1.9 mm). Hind margin of the pronotum angular, rounded at the apex, barely notched. Lateral lobes trapezoidal, as high as ventral width (2.8 mm). Prosternal tubercle large, conical, narrow at the base, rounded at the apex. Mesosternal space subquadrate; mesosternal lobes rounded.

Tegmina short but variable in length, extending beyond the hind margin of the second or third abdominal tergite; narrow, 2 mm in width; nearly in contact along dorsal edges, tapering anteriorly and posteriorly from the midpoint, apex angularly rounded. Hind wings present, reaching the first abdominal tergite's hind margin.

Hind femora elongated, 4.5 times longer than wide, exceeding the abdominal extremity. Upper basal lobe larger and longer than lower one. Lower genicular lobes acute; Brunner's organ well developed. Fore and mid tibiae ventrally with one external apical spine in addition to the six spines on the external margin and five and seven spines on the internal margin, respectively.

Hind tibiae with nine spines on the inner and 9–10 spines on the outer dorsal margins. Internal spines and spurs twice the length of the external ones. Tibiae shorter than the femora; arolium of all tarsi large, slightly longer than half the length of the claws. Last segment of fore and mid tarsi as long as the other two combined; last segment of the hind tarsi as long as first segment alone.

Abdominal tympanum large and well-exposed. Abdominal tergites 1–7 with a raised median ridge. Tergite X incurved with a shallow furcula. Epiproct triangular, slightly elongated, rounded at the apex, fairly flat, with two short, low, flat longitudinal ridges near the base on either side of the midline; twice as long as wide. Paraproct with a short anterior projection (Grunshaw 1990) (Fig. 3). Cerci laterally compressed, with apical half curved downward, widened, and spoon-shaped, not extending beyond abdominal tip. Subgenital plate short and rounded.

Male: Very variable in color and design: Pronotal disc varies from nearly plain beige with some dark markings (Fig. 2) to bicolorous with a dark longitudinal band, varying from a thin line (Fig. 5A) to a broad dark band (Fig. 5B). Dorsal part of the head primarily plain beige; in some cases, the dark longitudinal band on the pronotum continues on the vertex and the fastigium (Fig. 5B). Posterior halves of the tegmina (from the first anal vein to the hind margin) light beige. Face, sternites, median dorsal abdominal band, ventral outer surface of the hind femora, fore, and mid femora, and base of the hind tibiae ochre. Apical half of the hind tibiae (mostly ventrally, but variably) and the first two segments of the hind tarsi (dorsally) reddish. Antennae, cheeks, some dorsal pronotal spots, lateral thorax, abdomen, frontal halves of the tegmina (from the front margin to the first anal vein), internal areas of the hind femora, and a narrow basal ring of the hind tibiae dark brown. Outer surface of the hind femora variable, more or less light or dark brown, but nearly always marked by 2 or 3 white oblique stripes on a dark brown background. These stripes less evident if background color of the femur is fairly light.

Epiphallus consists of two small sub-square lateral plates connected by a short, slightly arched bridge. Ancorae large, articulated on the lateral plates, sharp, and prominently projecting. Lophi large and bilobed, with hind lobe broad, horizontal, slightly bilobed, and vaulted. Internal lobe of lophi globular and spiculated. Oval sclerites small and triangularly rounded; lateral sclerites long, narrow, and triangular, tips pointing downward (Fig. 4D, E). Morphometrics are given in Table 1.

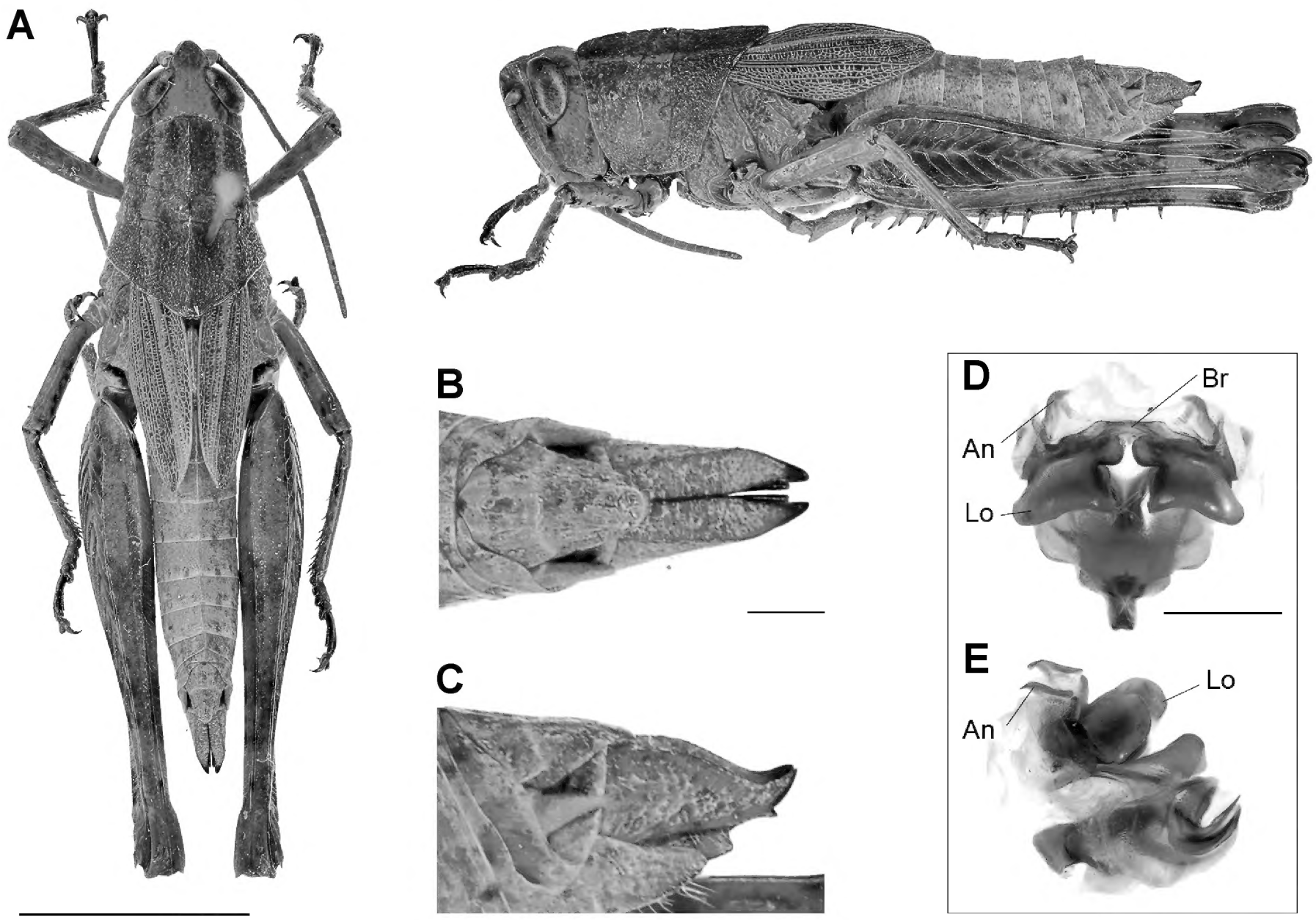

Fig. 4. *Eyprepocprifas insularis* Donskoff, 1982, female and male phallic complex. **A** Female; **B.** Ovipositor dorsal view; **C.** Ovipositor lateral view; **D.** Male phallic complex dorsal view (anterior end on top); **E.** Male phallic complex lateral view (anterior end on the left). An: Ancorae, Br: Bridge, Lo: Lophi. Monte Cintinha, São Nicolau, Cape Verde, Jan. 2023. Female: RMNH.INS1622467; Male: RMNH.INS1622466. Scale bars: 1 cm (**A**); 1 mm (**B–E**). Photo credit: Luc Willemse, NBC, Leiden.

Female: Same characters as male, with the following differences: Total length 28.8–33.4 mm; 1.5–2.0 times larger than male (Table 1). Tegmina 9.1–9.8 mm, reaching the hind margin of the second abdominal tergite. Hindwings reach the hind margin of the first abdominal tergite. Antennae reach beyond the hind margin of the pronotum. Tergite X without projections. Epiproct triangular, longer than wide, arched roof-like over the two longitudinal ridges on either side of the midline. Ovipositor: Dorsal valves long and slender in dorsal view; ventral margin straight in lateral view; ventral valves with a triangular tooth halfway along the ventral margin (Fig. 4B, C). Coloration: brown, grey, or grey-brown, plain or marbled, less contrastingly colored than male (Fig. 6). Tegmina unicolorous or with a light longitudinal line (Figs 4, 6). Distal half of the hind tibiae's outer side and the hind tarsi's first two segments reddish, as in males. Inner sides of the hind tibiae mainly black, except for a whitish ring in the proximal quarter after the knee joint.

Distribution and occurrence.—Eyprepocprifas insularis is endemic to the island of São Nicolau, Cape Verde. After its discovery in 1982, it was considered extinct by Lecoq (1996) and Baéz and Oromí (2005) following a lack of subsequent records.

In January 2023, it was found at several localities in Monte Gordo Natural Park (Fig. 9, Table 2). The species is considered to be restricted to the northern half of Monte Gordo Natural Park and its direct vicinities (Fig. 11). Despite its wide distribution within the park, densities seem to be low. To the best of our knowledge, there have been no other sightings of this species; as of the writing of this article, there are no records on online platforms such as iNaturalist and Observation.org.

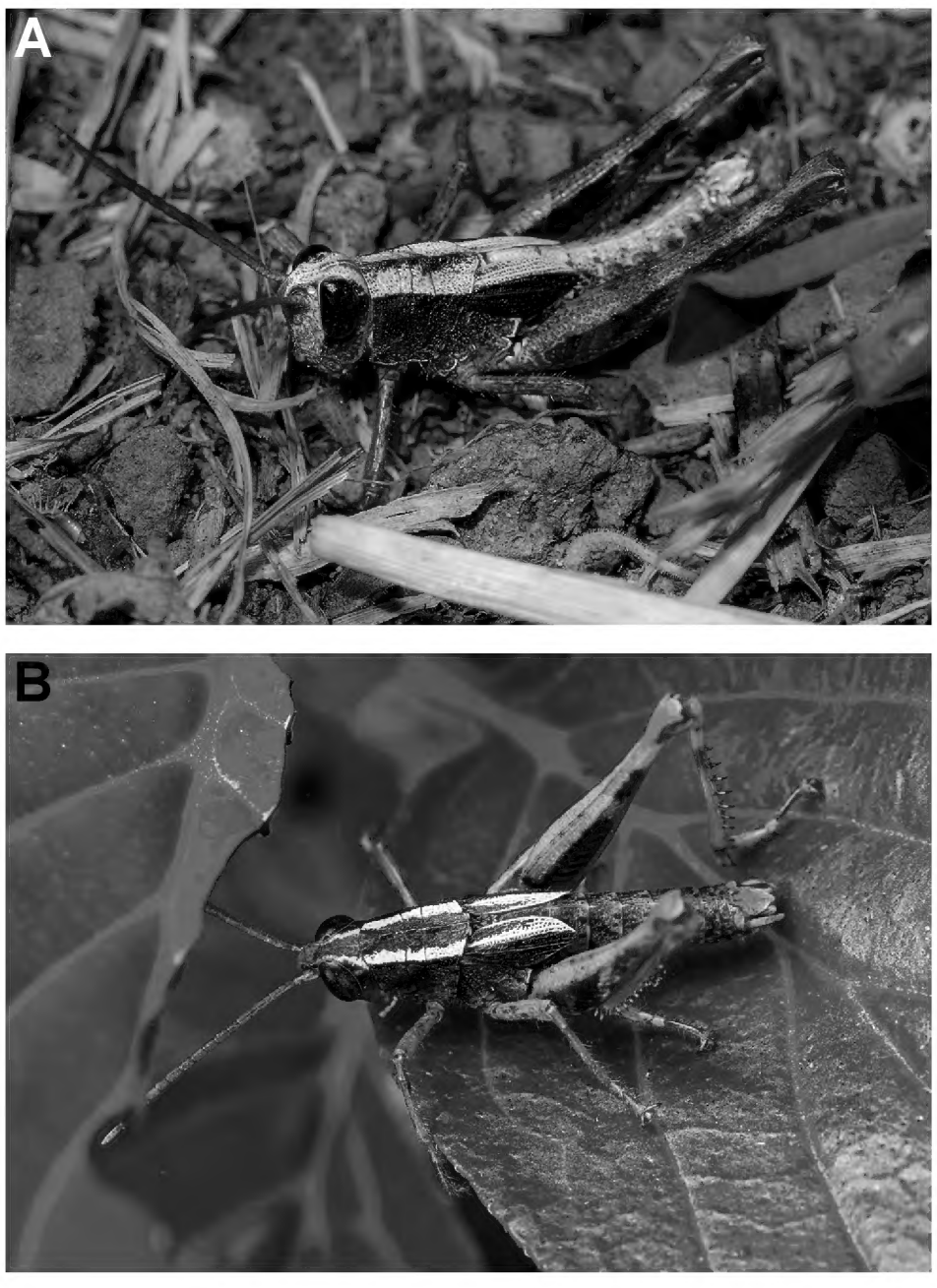

Fig. 5. *Eyprepocprifas insularis* Donskoff, 1982, males. São Nicolau, Cape Verde, Jan. 2023. **A.** Male from locality 2; **B.** Male from locality 4. Locality numbers refer to the numbers in Fig. 9. Photo credit: Rob Felix.

Habitat and biology.—Eyprepocprifas insularis is a montane species restricted to the higher parts of the island of São Nicolao. All records are from elevations between 650–1100 m.a.s.l. Table 3 briefly describes the sites and habitats of the January 2023 sightings of *E. insularis*.

Table 2. Sightings of *Eyprepocprifas insularis* Donskoff, 1982, São Nicolau, Cape Verde, January 2023. All records, including the collected specimens mentioned in the Material section, are shown. The location numbers refer to those in Fig. 9 and Table 3.

Date	Location	Elev. m.a.s.l.	N	Sex	Stage	Lat, Long E
23-1	Monte Cintinha (Loc. 2)	670	1	♂	Adult	16.6246°N, 24.3290°W
23-1	Monte Cintinha (Loc. 2)	700	3	♂	Adult	16.6243°N, 24.3297°W
23-1	Monte Cintinha (Loc. 2)	700	1	♀	Nymph	16.6243°N, 24.3297°W
24-1	Monte Cintinha (Loc. 3)	660	1	♂	Adult	16.6262°N, 24.3267°W
24-1	Monte Cintinha (Loc. 2)	670	1	♀	Adult	16.6246°N, 24.3291°W
24-1	Monte Cintinha (Loc. 2)	670	1	♂	Adult	16.6246°N, 24.3291°W
24-1	Monte Cintinha (Loc. 2)	710	1	♀	Adult	16.6236°N, 24.3307°W
25-1	Assomada Pass (Loc. 4)	650	2	♂	Adult	16.6397°N, 24.3712°W
25-1	Assomada Pass (Loc. 4)	650	1	♂	Adult	16.6398°N, 24.3705°W
25-1	Assomada Pass (Loc. 4)	650	1	♂	Adult	16.6397°N, 24.3707°W
26-1	Road Tarrafal–Cachaço, near pass (Loc. 1)	800	1	♂	Adult	16.6182°N, 24.3324°W
27-1	Monte Gordo (Loc. 6)	1100	1	♂	Adult	16.6213°N, 24.3490°W
27-1	Monte Gordo (Loc. 5)	1050	4	♀	Nymph	16.6279°N, 24.3543°W

Table 3. Site descriptions with sightings of *Eyprepocprifas insularis* Donskoff, 1982 on São Nicolau, Cape Verde in January 2023. Numbers correspond with those in Fig. 9.

1.	Road from Tarrafal–Cachaço, near the pass 800 m.a.s.l. Steep, rocky northeastern slope with scrub vegetation containing *Euphorbia tuckeyana* and *Furcraea foetida*. Mostly dry, with some wetter gullies (Fig. 8A).
2.	Trail eastwards from Capela de Nossa Senhora do Monte Cintinha 650–750 m.a.s.l.: dry, warm, southeastern slope with open, scrubby, and grassy vegetation alternated with more densely vegetated patches with scrubs and *Arundo donax* (Figs 8B, 10A).
3.	Part of the trail eastwards from Capela de Nossa Senhora do Monte Cintinha, where it bends to the northeastern slope 660 m.a.s.l. The cooler and humid conditions make it more densely vegetated with higher scrubs of *Euphorbia tuckeyana*.
4.	Assomada Pass, between 650 m.a.s.l. Steep, northeastern slope with *Euphorbia tuckeyana* scrubs (Fig. 8C).
5.	The northeastern slope of a deep valley with densely woody vegetation at 1050 m.a.s.l. with *Pinus*, *Eucalyptus*, and undergrowth of *Euphorbia tuckeyana*. Nymphs were found here on *Asteriscus smithii* Figs 8D, 10B.
6.	Steep northeastern slope at 1100 m.a.s.l. with *Pinus*, *Eucalyptus*, and *Cupressus* with undergrowth of *Euphorbia tuckeyana*.

Donskoff (1982) described the type locality as follows: "among loose, broken rocks along a graveled road at an altitude of 670 m.a.s.l. The female should be sought by beating the nearby bushes." Duranton et al. (1983) added, "Along the road to Tarrafal, at a pass located at the base of Monte Gordo. This Acridid was observed on a low wall bordering the road [see Fig. 8A]. The surrounding area was rocky, with steep slopes and a humid atmosphere, as this part of the island is frequently enveloped in clouds. The general environment of the capture site is highly heterogeneous, consisting of a mosaic of bare soil, grassy and shrubby vegetation, notably *Furcraea gigantea* [an introduced species from the Caribbean], and rocky outcrops."

Most records are from northeastern, southeastern, and north-facing slopes in the open to more densely vegetated habitats, varying from relatively dry to moist soils. All records are from sites where the native *Euphorbia tuckeyana* is present; however, several sites are dominated by introduced taxa such as *Pinus*, *Eucalyptus*, *Cupressus*, and *Arundo donax* (Fig. 8).

All sightings of adults were done on the ground; when flushed, they sometimes landed in the vegetation. The species at least appears to be active at night, but probably also during daytime. The first specimens were found at night, sitting on the ground and rocks, at a site visited before during the day without any sightings of the species. Later, specimens were also found during the day, but maybe these were disturbed before their discovery. Small nymphs were found on *Asteriscus smithii* (Figs 8D, 10B). With their very long hind legs, *E. insularis* can jump exceptionally far.

The holotype was found in October. In January 2023, adults and larger and smaller nymphs were found (Fig. 7). Nymphs present at the end of January undoubtedly resulted from egg-laying during the rainy season (August–October) or in winter when northeastern trade winds bring fog to the mountains above 600 m.a.s.l. (Brochmann et al. 1997): Surely, several ovipositions give rise to several cohorts of nymphs (hence the youngest and oldest observed at the end of January), but considering the low erratic rainfall, there is probably only one annual generation, but more observations must confirm this.

Accompanying species in the same habitat were *Diabolocatantops axillaris* (Thunberg, 1815), *Cycloptiloides canariensis* (Bolívar, 1914), two species of *Oecanthus*, *Phaneroptera sparsa* Stål, 1857, *Ruspolia fuscopuncata* (Karny, 1907), *Acanthogryllus* sp. and *Gryllus bimaculatus* De Geer, 1773.

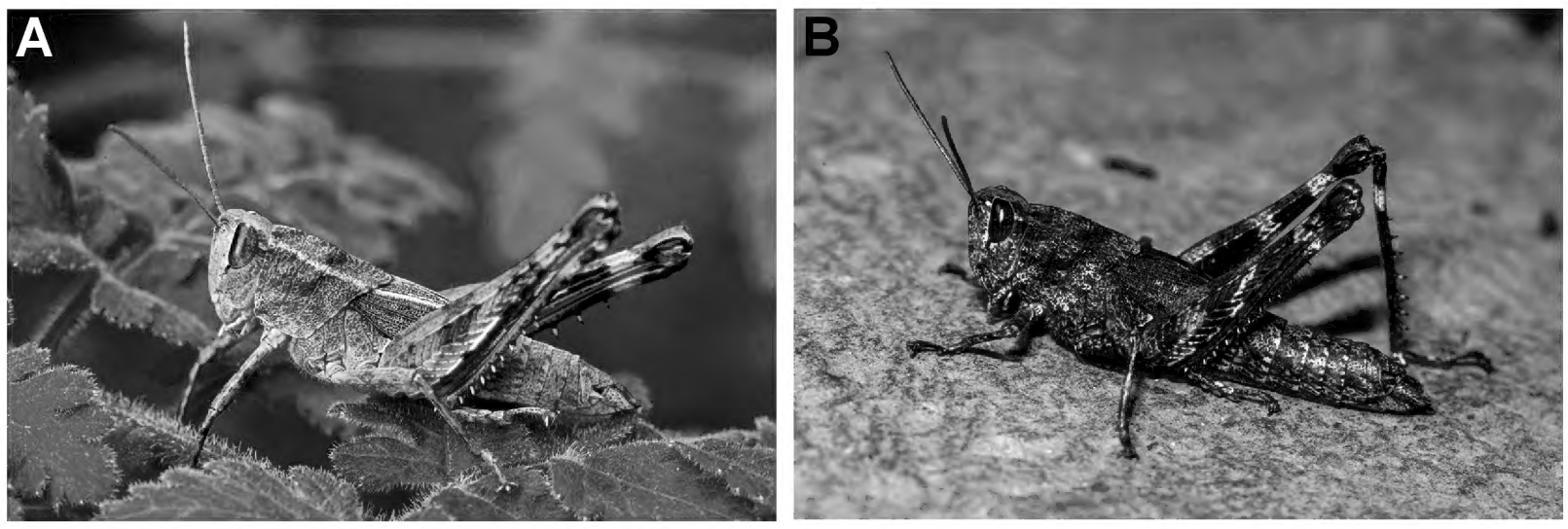

Fig. 6. *Eyprepocprifas insularis* Donskoff, 1982, females. São Nicolau, Cape Verde, Jan. 2023. **A.** Female from locality 4; **B.** Female from locality 2. Locality numbers refer to the numbers in Fig. 9. Photo credit: Rob Felix.

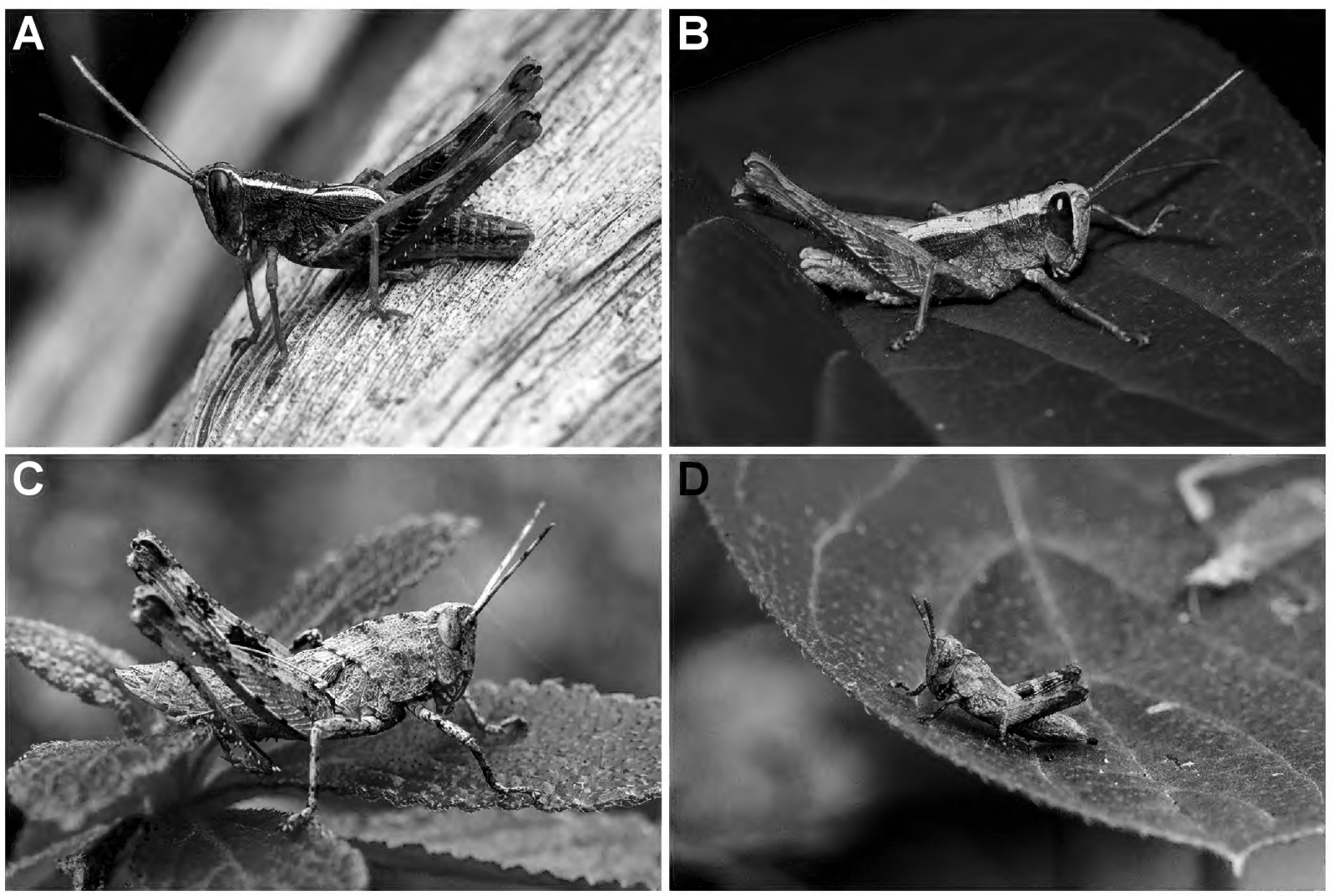

Fig. 7. *Eyprepocprifas insularis* Donskoff, 1982, males and female nymphs. São Nicolau, Cape Verde, Jan. 2023. **A.** Male from locality 4; **B.** Male from locality 2; **C, D.** Nymphs from locality 5. Locality numbers refer to the numbers in Fig. 9. Photo credit: Rob Felix.

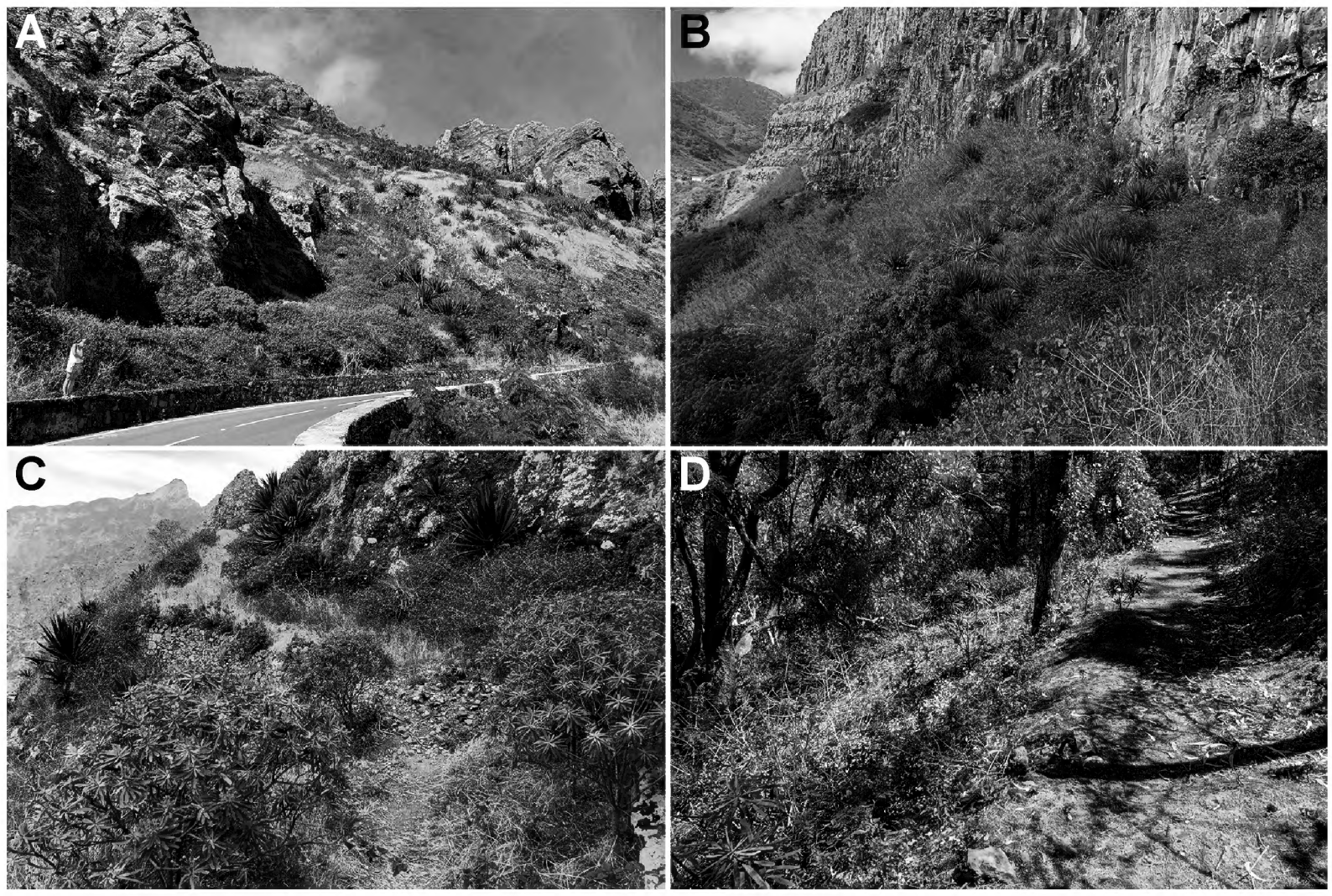

Fig. 8. Habitats of *Eyprepocprifas insularis* Donskoff, 1982 on São Nicolau, Cape Verde. **A.** Type locality (locality 1); **B.** Trail at Monte Cintinha (locality 2); **C.** Trail at Assomada Pass with *Euphorbia tuckeyana* (locality 4); **D.** Patch of forest with *Pinus*, *Eucalyptus* and *Cupressus* in Monte Gordo NP (locality 6). Photo credit: Rob Felix.

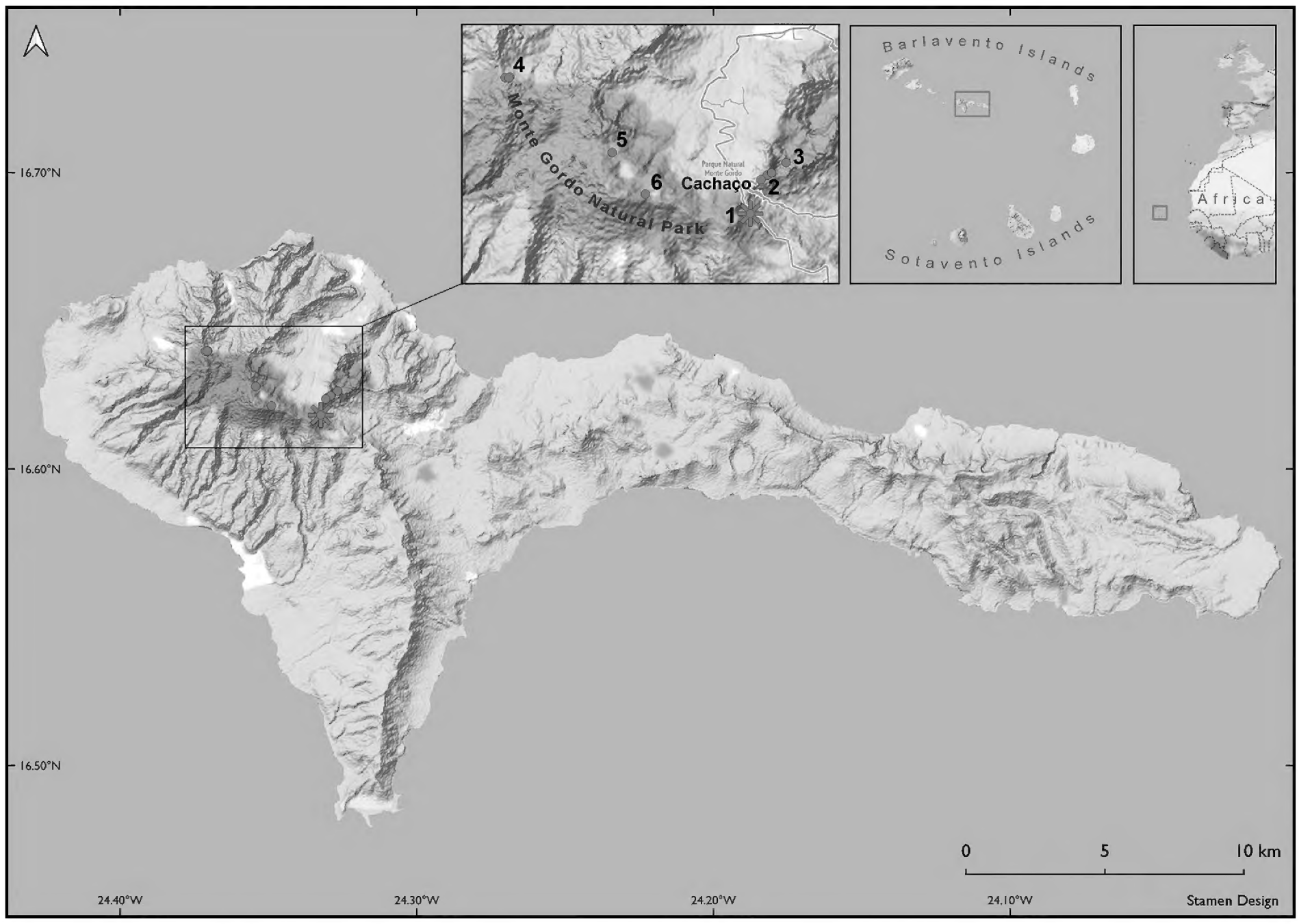

Fig. 9. Records of *Eyprepocprifas insularis* Donskoff, 1982 on São Nicolau, Cape Verde. New records are indicated with red dots, and the type locality is indicated with a yellow star. Numbers refer to site descriptions in the text. Monte Gordo Natural Park is indicated in dark green. Base map created using Stamen Design in QGIS.

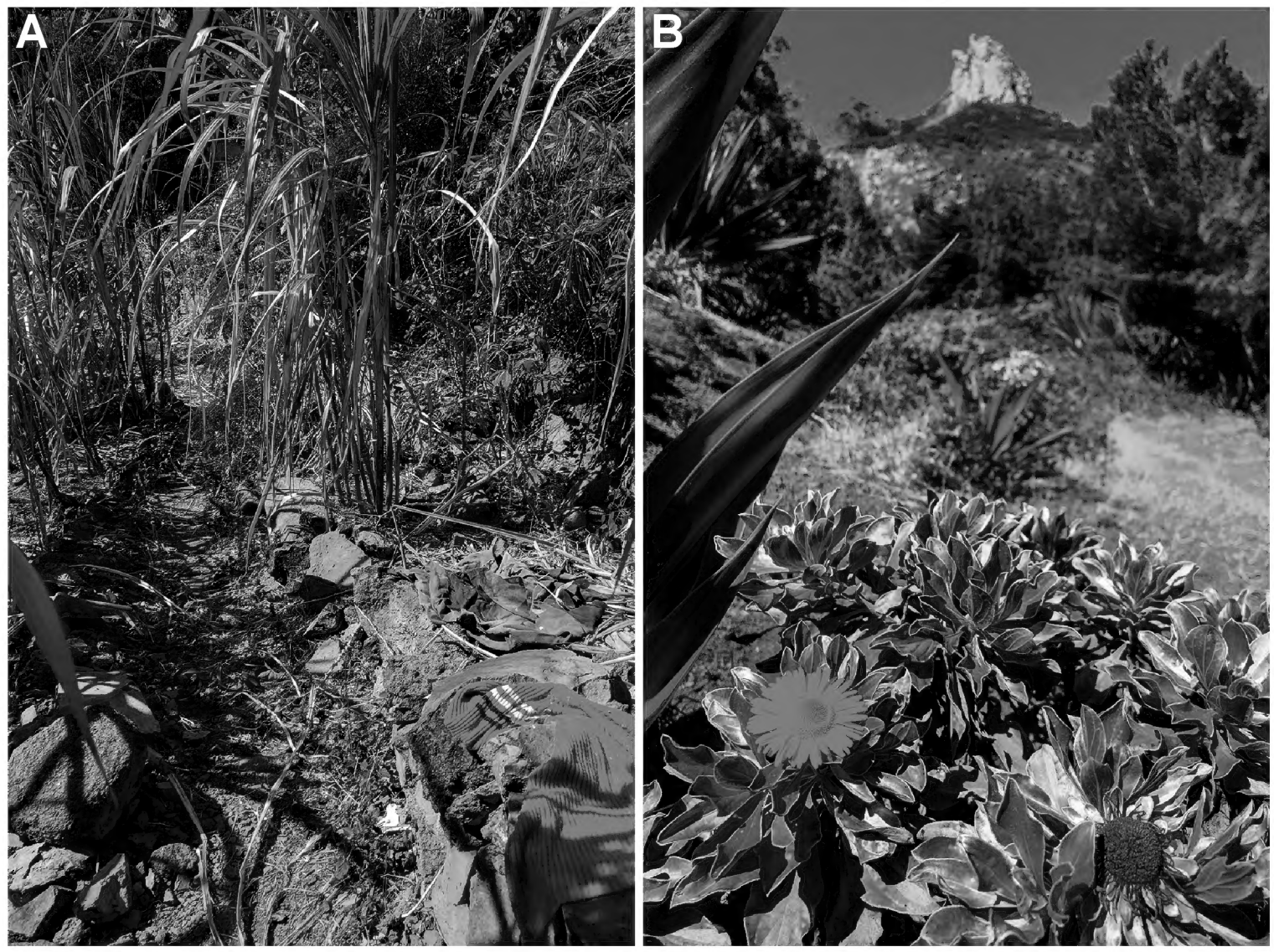

Fig. 10. Habitats of *Eyprepocprifas insularis* Donskoff, 1982 on São Nicolau, Cape Verde. **A.** Adults were found on the ground in an *Arundo donax* vegetation (locality 2); **B.** Nymphs were found on the leaves of *Asteriscus smithii* (locality 5). Photo credit: Rob Felix.

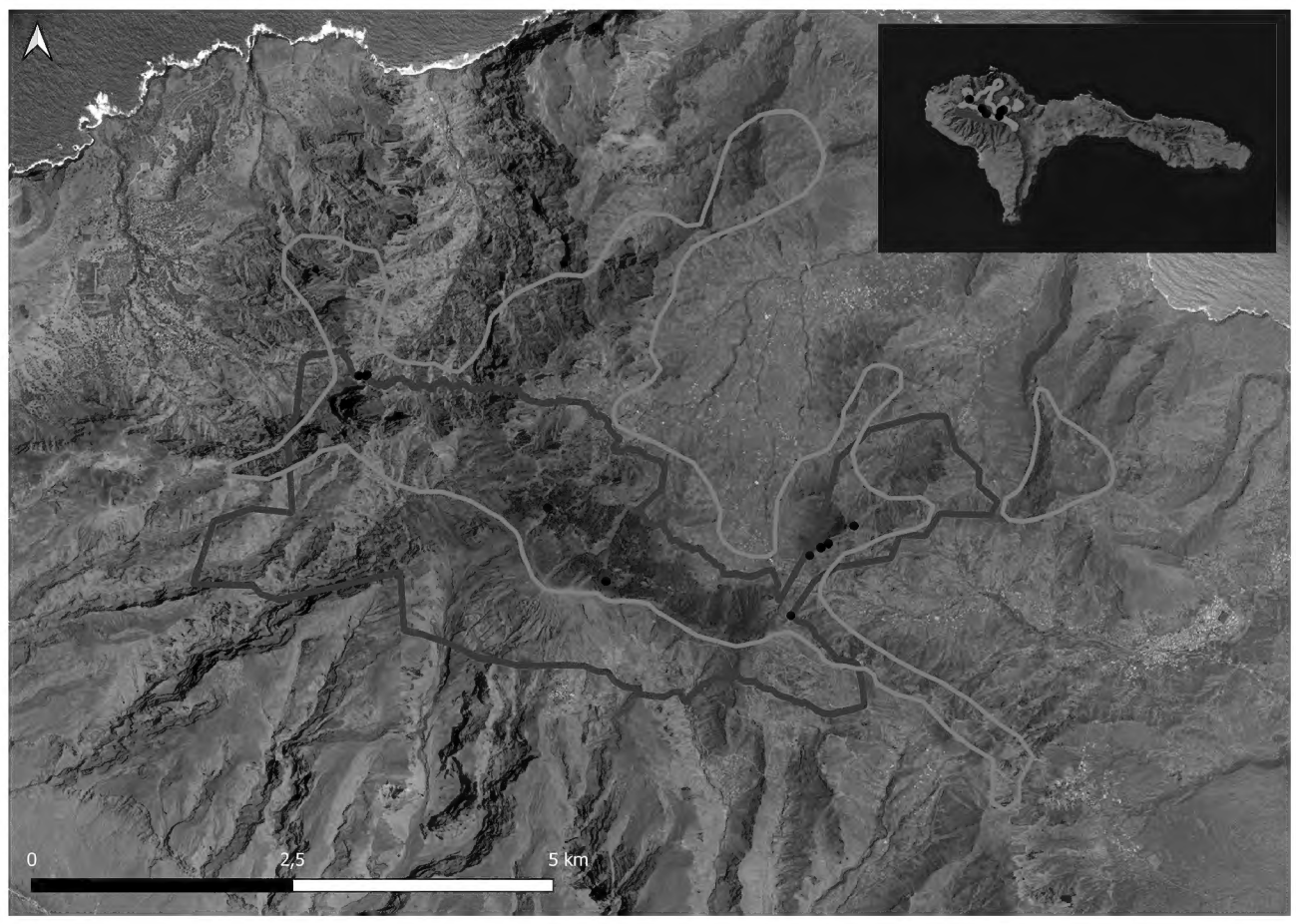

Fig. 11. Estimated distribution of *Eyprepocprifas insularis* Donskoff, 1982. Black dots: Extant distribution. Yellow line: Possibly Extant distribution, based on habitat availability. Green line: Monte Gordo Natural Park. Base map Copyright © Esri.

Proposal IUCN Red List Status

The AOO, calculated from the known data (ca. six sites), comprises 12 km². The EOO, calculated from the known data, is 4 km² (Lower EOO), while the maximal estimation is 35 km² (Upper EOO). The area of the polygon with the estimated geographical distribution (possibly extant) in Fig. 11 is 12 km². After entering the above data, the IUCN SIS calculated the threat category as Vulnerable, based on criteria D2, following a very restricted AOO (less than 20 km²).

Discussion

Cape Verdian Orthoptera.—Apart from *Eyprepocprifas* Donskoff, 1982 from São Nicolao, several other Orthoptera taxa are endemic to Cape Verde: *Sphingonotus atlanticus* (Popov, 1984) is endemic to the island of Santa Luzia, while several subspecies of wider-distributed species are endemic to various islands.

According to the most recent overview, 42 species of Orthoptera are known from the Cape Verde Archipelago: 28 species of the Caelif-

era suborder (Baéz and Oromí 2005, Mestre and Chiffaud 2023) and 14 species of the Ensifera suborder (Baéz and Oromí 2005). Launois et al. (1988) mentioned 37 species of Caelifera but included records considered erroneous or needing confirmation. A short history of Orthoptera research in Cape Verde is outlined by Buzzetti et al. (2005).

Living fossil.—The rediscovery of the only endemic brachypterous grasshopper, *Eyprepocprifas insularis*, on São Nicolau, an island with a volcanic origin dating back approximately five million years, provides significant insight into the island's ecological and evolutionary history.

This species, first described as the only unequivocal case of absolute endemism in Cape Verde, is morphologically distinct and not closely related to known African counterparts, suggesting a long evolutionary isolation (Duranton et al. 1983). The only other brachypterous members of the Eyprepocnemidinae subfamily in West Africa are the mountainous *Eyprepocnemis* Stål, 1873 species. Other brachypterous members occur in eastern Africa, such as species of the genus *Neritius* Bolívar, 1914. The bilaterally compressed male cerci with a downcurved apex, the specific morphology of the male internal genitalia (Dirsh 1965), and the presence of an anterior process on the paraproct suggest that *Eyprepocprifas* is closely related to the genus *Heteracris* Walker, 1870.

Its limited dispersal capability, attributed to brachypterism, supports the hypothesis that it colonized the archipelago during glacial periods with lower sea levels and reduced distances between the islands and the continent (Duranton et al. 1983). However, a direct land connection is not generally considered to have existed (Troll et al. 2015, Carracedo and Troll 2021), so the option through flight, with its brachypterism as a more recent adaptation, or other natural transport processes over marine barriers are considered plausible.

While it has been shown that the grasshopper fauna of Cape Verde is probably in perpetual evolution under the combined influence of periods of intense drought, which can eliminate the populations of certain species on one or more islands, and prevailing easterly winds, which can bring new populations/species from the neighboring continent (Duranton et al. 1983), *E. insularis* must have been there for a very long time and has been able to withstand the severe ecological conditions.

Mounting specimens of *E. insularis* proved quite challenging due to the remarkable difficulty of piercing them with a pin. Surprisingly, an exceptional amount of force was required because the integument appeared extraordinarily thick. This might suggest an adaptation to arid conditions, where a reinforced exoskeleton could provide advantages such as reduced water loss or enhanced resilience to environmental stress. This phenomenon exists in other insects, such as *Solenopsis* Westwood, 1840 ant species in the southeastern USA (Hymenoptera: Formicidae) (Ajayi et al. 2020), and is expected to exist in many more Orthoptera taxa.

Threats.—The highland vegetation, the native habitat of *E. insularis*, has undergone significant changes over time. Before human settlement (~5900–410 cal yr BP), the highlands were dominated by native woody species such as *Euphorbia tuckeyana* and *Dracaena draco* subsp. *caboverdeana*. Pollen studies show that this scrubland was relatively stable and supported a high diversity of endemic herbaceous and sub-scrub plant species, epiphytic ferns, and a variety of fungal communities, forming a humid wooded landscape (Castilla-Beltrán et al. 2020). Since human arrival (~410 cal yr BP), the native vegetation has faced several significant threats, such as the introduction of exotic plant species displacing native flora. Land use changes, including deforestation and grazing, have caused soil erosion and fragmented native habitats. Naturally occurring and anthropogenic fires have significantly shaped and degraded the vegetation, while tropical storms have increased erosion and degraded slopes (Castilla-Beltrán et al. 2020).

It remains unclear which aspects of the life cycle of *E. insularis* are affected by habitat alterations and which aspects represent key factors herein. For instance, the decline of native host plants or essential fungi as food sources may be driving factors. Increasing research suggests that fungi are a significant food source in invertebrates (Santamaria et al. 2023) and Orthoptera.

Several conservation actions have been promoted and implemented, such as reforestation with native plants, removing invasive plant species, and grazing control to protect native vegetation (Castilla-Beltrán et al. 2020). In light of the current climatic warming, we expect the endemic invertebrate fauna will benefit most if this occurs in naturally moist and least drought-prone locations, such as north-facing slopes or sheltered valleys, to ensure stable microclimates.

Despite the above-mentioned challenges, *E. insularis* demonstrates resilience, surviving in degraded habitats dominated by introduced plant species. Furthermore, a significant part of its habitat is protected as a natural park (Fig. 11). Monte Gordo Natural Park still contains some of the most significant remaining fragments of *Euphorbia tuckeyana* in Cabo Verde, alongside populations on Santo Antão Island (Castilla-Beltrán et al. 2020).

Future study.—The rediscovery of this species is a crucial first step toward its conservation. Further research is needed to determine the population size, exact range, ecology, and bottlenecks related to threats to its habitat, such as climate change.

In addition, during our short visit, several new Orthoptera taxa to Cape Verde were recorded that are not yet listed in the above-mentioned references: *Oecanthus dulcisonans* Gorochov, 1993 (Oecanthidae) on Santiago and *Cycloptiloides canariensis* (Bolívar, 1914) (Mogoplistidae) and *Ruspolia fuscopuncata* (Karny, 1907) (Tettigoniidae) on São Nicolau. The discovery of these species underscores the potential for future research in the archipelago.

Comparative studies, particularly in high-altitude and vegetative settings like Monte Gordo Natural Park on other islands like Santo Antão, may uncover related taxa or even undiscovered populations of *Eyprepocprifas*.

Competing interests

The authors declare that no competing interests exist.

CRediT author statement

Rob Felix: conceptualization, formal analysis (Red List), investigation, resources, data curation, writing – original draft, visualization; **Annelies Jacobs:** investigation, writing – original draft, writing – review and editing; **Michel Lecoq:** writing – original draft, writing – review and editing. All authors have read and agreed to the published version of the manuscript.

Acknowledgments

We thank Christophe Hervé and Laure Desutter-Grandcolas (Muséum national d'Histoire naturelle, Paris) for providing photographic material of the holotype of *E. insularis* in MNHN, Paris, and our reviewers Bruno Massa and Lara-Sophie Dey for their valuable comments on the manuscript.

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